

AVIATION WEEK

A McGRAW-HILL PUBLICATION

JAN. 16, 1950

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*than do all other
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Here are some L-M-lighted commercial airports:

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 . . . INDIANAPOLIS . . . JACKSON . . . KNOXVILLE
 . . . MILWAUKEE . . . MINNEAPOLIS-ST. PAUL . . . NASHVILLE
 . . . NEWARK . . . NEW YORK International . . . NEW YORK
La Guardia . . . PHILADELPHIA International . . . PHOENIX
 . . . RALEIGH-DURHAM . . . ST. JOSEPH, MO. (ordered)
 . . . ST. LOUIS . . . SALT LAKE CITY . . . WORCESTER
 . . . AMSTERDAM . . . BRUSSELS . . . CANTON . . .
DUBLIN . . . HANKOW . . . PANAMA CITY . . .
PARIS (Orly) . . . RINNEANA . . . SHANGHAI



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Runway light—controllable
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J-34 TURBOJETS

power the Lockheed XF-90 penetration fighter

The unusual sweep assigned to this Air Force fighter takes it far behind enemy lines. Such missions demand the maximum in fuel economy, performance and reliability of the aircraft power plant.

To meet these requirements, Lockheed selected Westinghouse J-34 Turbojets. Their small front

of area and light weight . . . characteristic of Westinghouse axial-flow design . . . make possible high performance fighters like the XF-90

jet plane.



Westinghouse

AVIATION
GAS TURBINES



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To land the supersonic Skyrocket, designers called for a super tire. They wanted an extremely small tire that would roll into very limited space. A tire strong enough to carry the highest pressures ever used in supersonic flight. A tire that would stand up to extremely high loads and landing speeds.

B. F. Goodrich engineers developed the new tire. They built it in two sizes. For the main wheel—30-in. dia. by only 24 inches high, 3½ inches

wide. For the nose wheel (above)—an 8-ply nylon 20 inches high, less than 4½ inches wide. Both tires are designed to carry 200 lbs. per square inch.

These little tires have handled the Douglas-Erie Segundo Navy Skyrocket in landing after landing—far beyond the specifications required.

If you have a tire problem, look to B. F. Goodrich for the best answer. BFG research produced the first high pressure tire—to solve the

carrier landing problem. The first low pressure tire—to make transport landings smoother. The first tread even tires—to land today's largest planes—and many other outstanding tire developments. Write about your problem to The B. F. Goodrich Company, Akron Division, Akron, Ohio.

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Speaking as both fixed base operators and Presidents of the Texaco Aviation Lubricants and Fuels Division of General Airlines, Inc., Keith Kahle says: "Texaco has more and greater pride in its work than any of us. We are a company that produces and manufactures products that are unique and efficient. This is truly reflected in the quality of the products. Texaco Products have gone big because in building a profitable operation."

millions of superior performances.

Line up with the leaders and handle Texaco. Texaco is preferred throughout the industry... by progressive airports, by leading engine and aircraft builders, and by the airlines. In fact—

More revenue airline miles in the U. S. are flown with Texaco Aircraft Engines than with any other brand.

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You make your service less costly when you handle Texaco because (1) from throughout the 48 States know and trust the Texaco name; (2) there is a complete line of Texaco Aviation Lubricants and Fuels to meet every need; and (3) Texaco quality has been proved by millions of



TEXACO Lubricants and Fuels
FOR THE AVIATION INDUSTRY

June 29, 1958 • TEXACO journal 10000000 • Aviation week Tuesday night • METROPOLITAN OPERA radio network radio Sunday afternoon

WHO'S WHERE

Changes

► **President** Fifth Up-Land airframe division of Detroit Foundry Erick, an employee named when the management changed last summer, when Jim Lovas, director of public relations, with Caryl and Pauline, advertising agency.

► William Spitzer, of the legal staff, now with Midwest Foundry, orange juice processor.

► Robert Morris, engineer, now managing a industrial project, an agreement with the U. S. Staff of the Military Production and Supply Board for the North Atlantic Pact. He will be stationed in London.

► Miss Blanca Palacios, former assistant to the export manager, has opened an office at 2111 Lake Avenue, North Beach, to represent foreign firms in the U. S. and to perform specialized services for businesses and visitors to the city.

► Lawrence B. Robinson, formerly Fairchild president, has been named the company's Director of Research. B. M. Lovell, formerly the general manager of the coated finishes division at Plainfield, I. L., I. N. Y.

► New Appointments—Frederick G. DeWeese has been named general manager of the Chicago Valley division of United Aircraft, at Des Plaines, Illinois, and by a traffic agreement, the Fairchild-Stokes division of PAA. United-Canada Air Lines appointed Capt. H. W. Ingolds general manager operations. J. L. Reed director of flight operations. R. M. Smith flight operations recommended Atlantic region, and George L. Johnson, joined Atlantic region. L. F. Shantz has been named general manager of passenger sales with TCA. He will formerly represent Ingolds.

General Electric's Avigation Agency division has been acquired by the Agency and Defense division, and George L. Johnson has been named manager. E. B. Johnson, a assistant manager; K. W. L. Lasson, was manager the Consolidated Valuair San Diego division, has been named assistant division manager.

► Extension—Edward Warren will pursue the last session of the ICOM Color Oil class after a protracted leave of absence due to illness.

► Knudsen—William Van Dusen, associated with Texaco Aviation for 27 years, the last two of them as director on public relations, has accepted full head of the independent service organization of business interests. Kenneth E. Miles accepted as director of public relations and advertising for Western Air Lines and has accepted an appointment in deputy chief administrative officer, International Civil Aviation Organization, Montreal.

► Sales Manager—Charles Speak Plaza Co. has promoted five sales representatives. Ted Bartholomew has replaced the late W. J. Scott in the Buffalo area. H. C. Fisher has replaced E. W. Bowman, resigned, in South Georgia. Roy Glicker has been assigned to the Cincinnati area. E. W. Fredericks has replaced B. E. Johnson, retired, with his resignation in Seattle, and J. B. Galloway has replaced the late K. E. Johnson in Oklahoma City.

INDUSTRY OBSERVER

► Aeromot propeller Model 220H has been FAA-approvred and is in production for installation on the new Lockheed GD-255 aircraft 250 hp. engine and will be standard equipment on the Ryan Super Navion. The 750 diameter propeller is equipped with the new Strato-Cruise control developed for higher altitude operations.

► Vickers-Armstrong's denial of British newspaper reports that it is developing a new 90,000-lb. turboprop transport with swept wings indicates that Vickers has shaved the first jet transport VJ101 design which it had under development more than a year ago. Manufacture is apparently not far off, but no jet power is available for the development. The propeller aircraft excepts the jet power as the only power source. Vickers is developing a new 100,000-lb. turboprop transport which will be a research jet. It also indicates that Vickers has probably withdrawn from the development of a four-jet bomber which was the military counterpart of the four-jet transport study.

► Curtis-Wright Propeller division is expected to complete a USAP manufacturing methods contract in May for an improved process for fabricating tapered steel tubes for hollow steel propeller blade manufacture. Contract is for \$397,000.

► After running some tests with the little Boeing gas turbine (AVIATION WEEK, Jan. 5) with shaft and propeller in a small boat, the manufacturer expects to try out the shaft turbine with a propeller in a small seaplane, probably the Boeing 375 Scoot, lance plates later in the spring or early summer.

► An Material Command is running a 150-hr. accelerated service test program on the new version of the Boeing B-52 bombers.

► At least 12 manufacturers have indicated their interest in the forthcoming two-seat liaison plane competition which the USAF is conducting. The company which has the most interest, and the one which has a decided interest in AN drawings, is the one which is the best equipped for the difficult assignment for most of the smaller manufacturers. Interested are: Avco, Boeing, Convair, Convair, Piper, Triplex and TEMCO, of the more established companies, and also Johnson Aircraft, Belair, Fla., Aerobat Co., Broomfield, Tex., Empire Flite Co., Douglas, Ariz., Johnson Aircraft, Tulsa, Tex., and Astro Flight, Long Beach, Calif.

► Wheeled skis for 10 Northrop YC-121D assault transports, ordered by USAF from Federal Aircraft Works, Minneapolis, are among the largest aircraft skis ever to be built. Previously the installations have been made on C-47 type planes but the Northrop plane gross weight (32,500 lb.) is considerably greater than that of the C-47.

► Separation load-lip doors being installed in the Convair RB-56 reconnaissance bomber will open or close in 2 seconds. Similar doors will be used especially on all B-52s. Photographs equipment in the RB-56 is carried in the forward bomb bay. It includes 14 different cameras with one 85mm field-length lens carried for high altitude work. The nose landing gear for the B-52 is 21' 6" with a seven-hour flight to Egypt in a Convair can be used. Usable cameras. Plans are being drawn with no compressing equipment, prior to a installation of the load-lip doors being carried under the aircraft wings in position.

► Personal Aircraft's freeholders, the Polaris, has received the first British aircraft category airworthiness certificate in all sub-divisions. The plane is the first in its class (50-12 passengers) in the world to comply with ICAO transport category A standards. A few exceptions or compliances are being claimed, the manufacturer states.

► Trans-Atlantic Airlines of Bangkok, Thailand, is negotiating for purchase of six Swedish twin-engine Scandia transports, for passenger service in Burma and Thailand.

► Transfer of 83 Martin AM-1 torpedo-boomers Matson to the Naval Reserve definitely designates the speeder Douglas AD series of torpedo-boomers as the Navy's Navy planes in this class, as has already been indicated for use in the air warfare the performance of orders for the Douglas planes.

► After approximately two year work on standardization of utility parts for engines and propellers, the Air Force Navy and Army committee on powerplant and propeller standardization has undertaken a study of the possibility of broadening its standardization work to other projects.

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AVIATION CALENDAR

Jan. 10-27—Fourth annual Air Transport Seminar, conducted by American University in cooperation with CAA and ATA. Washington, D. C.

Jan. 12-13—Taco-Navy-Rideavy meeting to discuss military radio interference limits, Washington.

Jan. 13-15—All American Air Meeting, Miami, Florida.

Jan. 16-17—Marine-Bureau Air Cruise der 10th anniversary, conducted by Florida Air Fleet Association.

Jan. 16-19—First Massachusetts Show, sponsored by American Society of Mechanical Engineers and the Society for the Advancement of Management, Cleveland Airport, Cleveland.

Jan. 15-16—annual dinner of the Traffic Club of Philadelphia, Bragauna Franklin Hotel, Philadelphia.

Jan. 17-18—University of Illinois second annual Citation Spray Operator school, Urbana, Illinois.

Jan. 21-22—11th annual Herring Night dinner, Hotel Astor, New York, N. Y.

Jan. 25-26—158th annual meeting, technical sections, Hotel Astor, New York, N. Y.

Jan. 26—North, annual, ICAO Council, Washington, D. C.

Feb. 12—National Engineers' Show, Conrad Hotel, Palace, New York, N. Y.

Feb. 27—Mar. 1—Budget meeting, American Society for Testing Materials, Hotel W. Penn, Pittsburgh.

Mar. 4-9—47th annual meeting, American Road Builders' Assn., Netherlands Plaza Hotel, Cincinnati.

Mar. 24-26—annual flight photography meeting, sponsored by the Institute of the Aeronautical Sciences, Carter Hotel, Cleveland.

Mar. 26—National Planes Exposition, sponsored by Board of the Planes Institute, New York, Cleveland.

Apr. 4-6—Engineering and Maintenance conference, Air Transport Ass., Hotel Continental, Kansas City.

Apr. 4-8—National Engineers' Exposition, sponsored by the Chicago Section of the Engineers' Council, Stevens Hotel, Chicago.

Apr. 15-20—Annual budget meeting, American Assn. of Airport Engineers, Hotel Illinois, Chicago.

Apr. 27-29—1970 aerospace meeting, Seaport of American Engineers, Hotel Statler, New York City.

May 3-6—Midwinter conference on fluid dynamics and the national meeting of the American Physical Society, dad dynamo division, University of Illinois, Urbana.

June 10-15—National Engineers' Assn. annual convention, Hotel Statler, St. Louis, Mo.

June 26-29—Annual meeting, American Society for Testing Materials, with exhibit of testing apparatus and related equipment, Chalfont-Holiday Inn, Atlantic City, N. J.

PICTURE CREDITS

1—McGraw-Hill World Survey, 1968-1970
2—Aerospace Industries Association, 1968-1970
3—American Airlines

NEWS DIGEST

DOMESTIC

Conflagration of Adm. Forrest P. Sherman in C47 of Naval Operations was postponed to Jan. 19 by the Senate Armed Services Committee. Sen. William Knowland (R., Calif.) is probing for a full inquiry into the cause of Adm. Louis Beaufort, Sherman's predecessor.

President Truman reappointed Joseph J. O'Gorman, Jr., as chairman of the Civil Aeronautics Board and Oswald Roth as vice chairman.

Boeing pilot Frank Ross Bridges has been charged by the CAA with flying as a captain and reckless manner. CAA chief CAB to revoke Bridges' pilot's license. Bridges, Bellanca's director-general of civil aviation, plotted the F-86 which crashed into an Eastern Air Lines DC-4 last Nov. 1, killing 55.

Segment of passenger aircraft totals 2,148,160 hr. in October, according to the Bureau of Census. That brought the year's total to 20,000,000 hr., up 7.7 percent from 1968. Of the total, 7.7 percent went to U. S. military customers. October shipments of civil aircraft totalled 225 planes valued at \$15.8 million. Total weight of civil aircraft for the 10-month period was up 17 percent, but value was off only 4 percent. Employment in aircraft plants in October was 115,095, down 2 percent from September. An additional 48,991 were employed in engine plants.

J. H. "Duke" Kinselberg, chairman of the board and chief executive officer of North American Aviation, Inc., was named president of the Institute of the Aerospace Sciences.

Union and management negotiations at the Propeller division of Curtiss-Wright Corp. finally announced agreement as a renewal of their labor contract. The new seven-year contract features a four-cent-an-hour increase, a compensated hospitalization plan, and \$1000 life insurance for each worker. Night shift bonus for men earned during 100 hours to earn an hour to 100 percent.

\$2500 scholarships for advanced study in jet propulsion engineering are being offered by the David and Lucile Packard Foundation. Three of the scholarships will be for two-year postgraduate study in the field of jet propulsion at the California Institute of Technology. Applications for the fall of 1970 may be submitted from the David and Lucile Packard Foundation, 123 Broadway, New York 5, N. Y.

Pan American Airways has shifted 25 American mechanics to London in order to perform as much maintenance as possible as its Concorde flights to the English metropolitan base. Concorde is using the Stratovias for most of the North Atlantic traffic, so except for normal maintenance jobs, which will be handled in London, London also does maintenance on PAA's DC-10s.

Pilot of the Atlantic division of Pan American World Airways voted to support a system-wide strike of all pilots. Pan American's contract with the pilots is being mediated by the National Mediation Board. Two chief grievances charged by the pilots are (1) Pan Am and one of three planes on Atlantic routes as a navigator, thus requiring a captain which forbids a pilot to fly more than 12 hours on a single leg, and (2) Pilots of captain rank are being assigned to the Atlantic route, while junior captains in other divisions continue to fly as captains. The captains flying as co-pilots receive senior captain's pay.

JAMES C. Zeller was elected to the presidency of the Society of Aeronautical Engineers for 1970. Zeller is chairman of the engineering board of the Defense Corp. An officer of the society elected were Raymond D. Kelly, United Air Lines, vice president for transportation activity, and Donald D. Hestad, CAA, vice president for aircraft activity, and Wright A. Perkins, Pan Am, vice president for aircraft preflight activity.

FINANCIAL

Northwest Airlines last week disclosed the regular quarterly dividend of \$2.00 cents per share on the company's 900,000 shares of 4% cumulative preferred stock.

The dividend, totaling \$112,125, is payable Feb. 1 to stockholders of record at the close of business Jan. 20.

INTERNATIONAL

Airlines of Colombia (Avianca Nacional de Colombia) announced its planes flew 49,310 hours in 1969 and carried 40,919,000 passengers. Avianca carried 93,603 passengers and 66,094 tons of cargo.

Luzan of Colombia (Luzan Aeronave Nacelera) is preparing to extend service to other countries. The company is negotiating the purchase of necessary equipment.



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of magnesium
and the harder
aluminum alloys

In stamping magnesium and the harder aluminum alloys, the application of heat is recommended to eliminate crackling.

Developed for this type of work, the new CP Hot Dimpler incorporates Ziegler's own die-dimpling punches and dies which insure accurate nesting of dimples. Write for detailed information on the new CP-450-EA hot dimpler.

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HE COMPRESSIONS • HYDRAULIC BOTTLES
PNEUMATIC AND HYDRAULIC CYLINDERS
HYDRAULIC CYLINDERS • ELECTRIC MOTORS

Air Power Comparison

Number of Aircraft Authorized	1950	1951
U. S. Air Force	1,210	1,385
(23.5 million lbs.)	(23.3 million lbs.)	
U. S. Navy	768	799
(6.9 million lbs.)	(8.1 million lbs.)	
Total	2,018	2,184
(30.4 million lbs.)	(29.4 million lbs.)	

Recommendations for Minimum Military Aircraft Annual Procurement

All Contracting Committee (1949)	
Minimum after world peace is well marked	30 million lbs.
Minimum to compete in continuing world peace	60 million lbs.

President's Air Policy Committee (1949)

Recommended for 1951	34 million lbs.
Recommended for 1949	56 million lbs.
Recommended for 1950 (Major re-evaluation of entire program in light of existing circumstances) No such re-evaluation is being made, USAF spokesman says.	

Cooperated Aviation Policy Board (1948)

Fleet strength to mount a successful air offensive requires	immediately
aircraft	133 million lbs.
Strength necessary to prevent loss of our regions currently	63 million lbs.

Labrador Study (1946)

Aircrew requirements to provide base for expansion

18 million lbs.

XF-91 Completes Phase One Tests

Republic Aviation's new XF-91 light-attack Air Force interceptor has successfully completed its Phase One flight tests at Edwards Air Force Base, Calif. Approximately 40 flights were completed with company pilots and crews on charge, and the craft has been turned over to the Air Force for Phase Two performance tests to be conducted by Maj. Richard Johnson, holder of the service's official speed mark.

During the plane's first flight several stability problems were noted with the aircraft. Some speed attained was not to the "ideal" airspeed range to insure the flight could not match XF-91's stall and dive rate. Full and lateral control in stalls is attributed to the wing's aeroelastic. Company says that wing and tail enveloped, rendered control stability under all conditions, while the aileron booster system permitted roll control even while maintaining good "lift" qualities.

The craft's variable incidence wing operated for the first time in flight, proved to be entirely feasible from a control standpoint according to reports, and was operated through the remainder of the flight with no noticeable effect. The aircraft's performance of vibration, stability at high speeds, range afterburner boost and the air-to-air boost system. High speed dives concluded the Phase One program. This was conducted with the GE J47 engine alone, the four rocket motors not yet having been fired.

Piper Leads Lightplane Market

Piper Aircraft Corp., with a total of 1,185 aircraft produced, led the lightplane industry in shipments for the year 1949, followed by Cessna Aircraft Co. which shipped 337 planes. With dollar totals not yet completed, Cessna appears in dollar value of shipments for the year.

Piper aircraft totals completed last year showed approximately 737 planes shipped by 12 manufacturers during the year, at least half of the 968 planes shipped by almost the same group in 1948, and hardly more than a tenth of the 13,234 shipped by the lightplane industry in their best year, 1946.

Aerospace Aircraft Co., No. 3 position with 311 planes, rated next Bench Aircraft Corp. reporting 293. Ross Aerocraft Co. was fifth with 215 planes. Sixth was the bankrupt Lorraine Airplane Corp. which shipped 156 planes before it closed its doors last summer.

Civil Aviation Budget Box Score

Agency	1950 Final Appropriation	Proposed 1951	1951 Final Recommended
Civil Aviation Adminis-tration	\$1,621,500	\$106,000*	\$4,327,000
Civil Aviation Adminis-tration	140,825,000 (Pla. 367,300, 300 contract authen-tications)	1,841,300 (Pla. \$4,500, 100 contract authen-tications)	212,535,000 (Pla. 370,162, 300 contract authen-tications)
National Adminis-tration for Aerona-ture	5,000,000 (Pla. \$10,000, 100 contract authen-tications)	5,000,000 (Pla. \$15,000, 100 contract authen-tications)	\$2,600,000 (Pla. \$17,000, 100 contract authen-tications)

* To absorb pay increases

More Money for Flying Aids

Big increases asked for CAA and CAB, with airports and airways scheduled for most of additional funds.

Recent appropriations for federal civil aviation programs are proposed in the President's 1951 fiscal year budget.

Civil Aviation Administration

\$23,716,900-321,593,000 cash and \$70,163,500 contract authentication.

This would top CAA's 1950 allocations of \$20,725,900 (\$14,025,902 cash

and \$67,300,000 contract authentication), biggest budget in debt, by 37%, \$90,598. It would open up 424 new positions, increasing the total number of permanent CAA posts from this year's 18,184 to 18,705. Budget funds would go to Radio Technical Commission for Aeronautics' all-weather navigation system, both "transistor" and "vacuum" planes, and for airport development.

Civil Aviation Board

\$6,331,000. This is \$792,500 over the Board's \$5,638,500 for the current year, and would increase total CAB position from 662 to 700.

The President's Board recommendations for new funds were incorporated by two requests for legislation aimed at establishing government authority for air traffic control.

Separation of airfares from service and payment to carriers was urged by

though continued subsidy and "as required for the present," the President stated, "the industry should be expected to become increasingly self-supporting in the near future." The President also would allow the Board to stamp down on intrusions under the present system of dual pay.

The proposed budget which initially rates air transportation under existing legislation may itself merit review. While a considerable gain in efficiency has been obtained by the air lines since the end of the war, there are undoubtedly important opportunities for further improvement. The 1951 budget will permit the CAB to conduct more intensive investigations of airline efficiency, and to develop operating cost standards.

■ Unified program. The President suggested he would submit legislation to unify promotional and regulatory activities of the government for various forms of transportation after reviewing in part the program of the Civil Aeronautics Board. The agency's name reflected Senator's own (Aviation) Wren, then 26, implying that government promotion had aided aviation at the expense of railroads, also vital to the national defense.

He also suggested user fees for government-financed transport facilities, so that programs the public did not value highly enough to pay for could be eliminated.

Following is a breakdown of the 1951 fiscal year budget proposed for the Civil Aeronautics Board.

■ Salaries and expenses, \$18,210,000. This compares with \$14,462,100 for the current year.

■ Air transportation facilities, \$10,961,520-\$14,593,000 cash and \$19,461,500 contract authentication. The comparison with \$14,452,000 (\$11,863,000 cash and \$16,920,



COUPLED PROTEUS TESTING CONTINUES

Test is still testing its coupled Proteus turboprop engine and has pushed up test date for delivery of a complete set from the summer of 1950 to the spring of 1951. Siemens-Rex plant to use the turboprop in its Proteus-Rex flying boat. Big gain in

is that it has become impossible to obtain the desired fuel efficiency because of mechanical problems inherent in the engine shaft and shell in the coupled layout. Piggot says it is inherently strong, short life of combustion chambers, and of averaging

range, improved passenger comfort (it is also pressurized) and would be a tremendous nonstop competitor against the Atlantic in the trans-Atlantic market.

November Air Force Contracts

P&W, Convair and North American get largest orders
in awards totaling more than \$230 million for month.

Contracts totaling more than a quarter of a billion dollars were awarded by the Air Force in November, with Pratt & Whitney, Consolidated and North American getting the lion's share of the business.

Pratt & Whitney, New Haven, Connecticut, bidirectional Wright T66 turboprop engines, serials 6132, 6133, 6134, 6135, 6136, 6137, a back-to-new engine. The Defense Department's procurement action plan fiscal 1970 in its last year with contracts totaling more than quarters of a billion dollars (Aviation Week, Dec. 26, 1969). Cambridge (Mass.) Research Laboratories awarded contracts valued at \$16,000,171 and Wright Laboratories, Rad Rad, N. J., let contracts worth \$121,597.

Cost-plus fixed fee contracts, let AMC awards with \$3 valued at \$86,626. Fixed price including price readjustment contracts numbered 46 valued at \$88,007,287 and fixed price contracts totalled 472 worth \$12,100,835.

Greater number of AMC contracts were negotiated, 346, valued at \$226,434,577. AMC awarded 170 contracts valued at \$1,195,133 to formal advertising contracts, placed 219 contracts totaling \$1,516,560 with semi-bid negotiations (defined as those employees less than 100 persons).

► **Boeing-Cessna.** Cessna's November total came from five contracts worth \$6,177,229. The firm's October total was \$46,757,511. One Cessna contract, \$2,762,500, was for modification of the last 11 airplanes on an undelivered contract. Another was \$2,258,000 for supply of acquisition of facilities including buildings, landholdings, representations, machinery and equipment. Both contracts are for the Fort Worth, Tex., division. The San Diego plant received a contract for \$1,192,011 to repair and/or reengine 36 T-38A aircraft, many more than 10 years old.

Pratt & Whitney received a single \$6,317,210 contract for a confidential project and North American another contract, totaling \$1,943,757.

North American's largest three were \$3,499,803 for scheduling of T-6 aircraft. Completion of the work is scheduled for January 1971.

Following is list of November awards in excess of \$100,000, with estimated completion date. November contracts for less than \$100,000 will be published Jan. 25.

Convair. Douglas has used considerable bidding on the C-141 and is in a good position to go into commercial production if the market develops.

Pratt & Whitney. Aeritalia, Breda Avia-
zione, Torino, S. L. government, Whiteman,
Mo., and the U.S. Air Force, serials 6110-
6114, AG space probe, AMC, 1969.

Pratt & Whitney. Aeritalia, Breda Avia-
zione, Mo., serials 6105, 6106, 6107, 6108,
6109, 6110, 6111, 6112, 6113, 6114, 6115, 6116,
6117, 6118, 6119, 6120, 6121, 6122, 6123.

Convair. Aeritalia, Breda Avia-
zione, Mo., serials 6101-6104, 6105-6108,
6109-6112, 6113-6116, 6117-6120, 6121-
6124.

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Oct. 1969 1100-1144, static prop boost-
er, type A-10, static compressor, Jan. 1970,
1969-1970.

Pratt & Whitney. Aeritalia, Breda Avia-
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6124.

it being available to engage currently operating, to domestic and foreign airways, as well. Each route will be conducted at the following locations and times:

Jan. 15-16—1100-1144, static prop boost-
er, type A-10, static compressor, Jan. 1970.

McDonnell Douglas. McDonnell Douglas
Aviation, Inc., St. Louis, Mo., static prop
compressor, Jan. 1970.

McDonnell Douglas. McDonnell Douglas
Aviation, Inc., St. Louis, Mo., static prop
compressor, Jan. 1970.

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McDonnell Douglas. McDonnell Douglas
Aviation, Inc., St. Louis, Mo., static prop
compressor, Jan. 1970.

McDonnell Douglas. McDonnell Douglas
Aviation, Inc., St. Louis, Mo., static prop
compressor, Jan. 1970.

Other common stock transactions by
officers and directors of aviation firms
reported in the period from Nov. 1 to Dec. 31, 1969:

Air Maritime Corp. Sale of 100 shares by
William C. Clegg, Jr., director, Jan. 1970.

Air Maritime Corp. Sale of 100 shares by
William C. Clegg, Jr., director, Jan. 1970.

Air Maritime Corp. Sale of 100 shares by
William C. Clegg, Jr., director, Jan. 1970.

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William C. Clegg, Jr., director, Jan. 1970.

Air Maritime

FINANCIAL

Bankers View Airline Prospects

Survey finds industry in healthy state with steady traffic gains forecast. Opposes CAB securities control.

The airline ags were surveyed by a committee of the Investment Bankers Ass. of America at that group's recent annual convention. The second report, 400 pages, was issued in December. It highlights the committee's conception of the most important developments in the industry during 1949 and attempts to forecast the probable course of events in 1950 with special emphasis on matters where IBA action seems desirable. This survey was prepared for the guidance of members in the leading investment banking firms of the country who may be expected to influence financial policies of most airlines in 1950.

The IBA committee expects that the "Big Four" airlines will show net income before income taxes of about \$23 million for 1949, or about \$69,000 in 1948. These operations are expected to result in a cash gain of \$35 million for 1949, as compared with \$73,966,000 in 1948 and only \$12,931,000 for 1947.

CAB Money Policy—The importance of Civil Aviation's fiscal policy toward increased mail payments as a factor in the industry's improved showing is carefully analyzed. The Committee declares: "Fortunately, the present policy of the Board appears to be not to reduce mail rates until the industry has shown substantial earning power over a period of time and received at least a substantial part of past losses."

Reporting on the results of such a course, current CAB action has shown a sharp tendency to cut impenetrable mail rates of established air carriers as soon as material earning power has been demonstrated. This was largely illustrated during 1949 when the Board pressed for lower mail rates for Panair and the international division of both Northwest and TWA.

This is a very important qualification and can also place the outlook for mail earnings in an entirely different perspective than that inferred from the IBA report, if the Board carries the trend to persistent mail rates.

The report concludes that if each air carrier showed continuity and was based on fact rather than fancy, there can be a conservative basis. If not, a rate war can ensue which will swallow traffic from present first-class service to air coaches without financial advantages

to the airlines and additional working capital, \$125 million—total \$325 million.

The committee takes a "very strong" position opposing the grant of power only to issue grants supplementary and sufficiently different from State/air service to produce consequences justifying lower mail rates despite that a general devaluation of the new situation will not be permitted.

For Study Growth—Due to improved safety and regularity, the introduction of lower mail rates should bring a general devaluation of the new situation will not be permitted.

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The IBA committee, believing that there is no such competition, maintains that merges among the airlines would represent an important cause of converting that condition and stabilizing the industry. Reference is made to CAB's power to inspect service on routes where the public convenience and necessity no longer require it, but, despite such talk as the slogan, this power has not been applied to any significant extent.

According to the committee, the only way to achieve any substantial number of mergers or major consolidations of airway routes would be to grant CAB power to force mergers or resolve conflicts. However, the report asserts that "the granting of such powers to CAB would undermine the stability of the industry and therefore it would go far to such a minor degree that your Committee does not recommend it."

For Better Lanes Refurbished—A significant forecast advanced by the committee is the estimate of additional or refurnished capital needed by the airlines in the next three years in advance of the major re-expansion program anticipated in 1951, when new jet aircraft and turboprop transports become available.

The estimate of the net new capital needs is indicated as follows: 52 first-engine aircraft, \$88 million; 123 twin-engine aircraft, \$53 million; re-

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TUBE FITTINGS • VALVES

AERONAUTICAL ENGINEERING

Causes and Control of Powerplant Surge

Analysis of adverse operating characteristic in ducts, compressors, diffusers shows way to attack problem.

By R. H. PEASE*

Staging in aircraft compressors, diffuser flow rate is a basic operating consideration. The compressor must be wound not only because of decisive rotation act up, but also because of loss of pressure recovery in these components.

Magnitude of the rotation can cause failure of lightly stressed aircraft parts, and loss of pressure recovery reduces power output of the propulsion system and fuel consumption.

Surging in the pulsing-flow condition occurring during operation of a compressor at reduced flow. The mechanics of the surge can be explained with the aid of the compressor steady-state characteristics, that is, a diagram showing variation of pressure of air delivered with the mass flow rate delivered.

Two conditions always exist when surging occurs. The characteristic of the compressor has a positive slope, that is, pressure decreases with decreasing mass flow, and the receiver volume is appreciable compared with the compressor volume.

► **Stability Condition—** Variation of compressor pressure ratio with flow rate is shown in Fig. 1a. In Fig. 1b, the present rate of the inlet of the receiver or piping is depicted in relation to the flow rate into the receiver. For steady flow conditions, the flow rate of the compressor at the same rate as the flow out of the receiver is termed \dot{m}_1 . If their curves are superimposed, the intersection of the receiver and compressor pressure characteristics represents the operating point.

If steady flow characteristics are used, it is seen in Figs. 1a and 1b that for one displacement from equilibrium (\dot{m}_1) there is a stability of the system to return to \dot{m}_1 . Then, if the compressor suddenly begins to operate at a flow rate (\dot{m}_2) greater than that of equilibrium (\dot{m}_1), the excess of the desired pressure by the receiver (P_2) over the supply by the compressor (P_1) imposes a decelerating force on the air

* Supervisor of experimental models, Aeropneumatic Laboratory, National Bureau of Standards, Washington, D. C. These presented were worked out jointly with Dr. W. C. Rausch, National Bureau of Standards, Inc.

column and will cause the flow rate to decrease toward \dot{m}_1 , since deceleration increases the required supply pressure.

Also, for a turbine, it results in a lower flow rate (\dot{m}_1), the excess of available supply pressure from the compressor at \dot{m}_2 over the desired pressure of the receiver at \dot{m}_2^* (surge) causing a decelerating force on the air column and will cause the flow rate to increase toward the operating point (\dot{m}_1). This tendency in return to equilibrium is called stability.

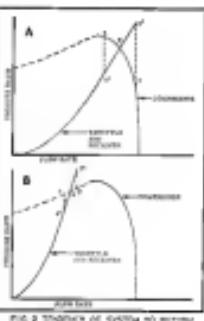
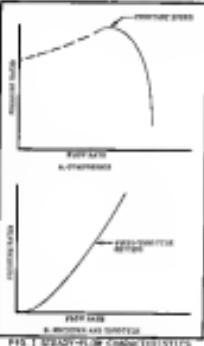
That surge occurs when the rapid increase point is on the adiabat of the compressor characteristics (Fig. 2b) may be explained by considering the dynamic response of the receiver. Since the receiver has a certain acceleration volume when a compressible fluid such as air is used, when the air may move more rapidly than it is delivered at the receiver outlet at a given moment. Dynamic and steady state characteristics are the same for the expansion, because at very little effective expansion volume. If the compressor delivers air excess air flow suddenly, it will be accelerated immediately in the receiver and the pressure there will increase slightly.

That phenomenon is illustrated by the dotted line on Figs. 3a and 3b. At the flow rate and of the compressor in curves respectively, the position in the receiver (Fig. 1b) rises only slightly to \dot{m}_1' , but the compressor is capable of delivering air at a higher pressure (P_1'), because the receiver is still full. The pressure in Fig. 1b is still rising, since the pressure demand (P_2') is greater than that which the compressor can supply to \dot{m}_1' .

That suggests a criterion of stability. When the dynamic characteristic of the receiver and throttle assembly has a slope greater than that of the compressor, in operating system combining the two characteristics is stable. When the receiver throttle slope is less than the compressor slope, the combination will be unstable.

► **Surge Cycle—** Mechanics of the surge cycle can be described with the aid of Fig. 4. During operation at any point \dot{m}_1 or \dot{m}_2 is, generally the case.

The cycle starts at \dot{m}_1 , pressure builds up in the receiver, with the compressor delivering air according to its characteristic. Air is passed into the



receiver while the compressor is operating along the characteristic from (a) to (b). From (b) a reduced flow rate is required, and it is attempting to follow down the left side of the characteristic to (c), the compressor is delivering less pressure than is already present in the receiver.

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FIG. 1B: LAMINUM[®] shims are extremely thin, yet can be easily formed into complex shapes.

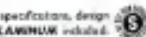
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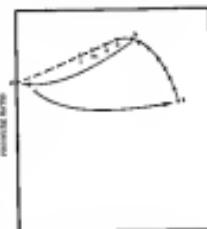
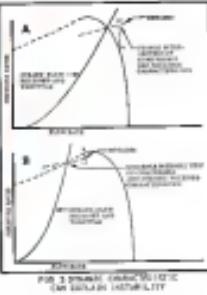


FIG. 4. PRESSURE RATE OF A SURGE CYCLE

Flow out of the compressor stage and begins to reverse—an "a" begins to flow from the higher pressure in the reverse back through the compressor. When this begins, the compressor is no longer operating as the characteristic in (a) but is now operating at (d), the no-flow condition.

Since (d) is at an even lower pressure than (c), no conditions to flow out of the reverse until the pressure there has dropped to (d) and overshoots a little to (a). When this happens the cycle is completed and another cycle starts at (a).

Stability characteristics¹ have indicated that frequency and magnitude of surge pulsations are affected by the volume of the compressor and receiver system. It was noted that an increase in volume resulted in an increase in amplitude and a reduction in frequency of the pulsations. Measurements² were reported showing that a fluctuating fire at the inlet of the compressor has little effect on the location of the surge point.

Another³ report verified that the compressor and receiver system staged as a

unit, that the present pulsations was frequently non-dissipative and that there was a transition between stable and pulsing operation in which there were erratic pulsations of smaller magnitude than the surge pulsations.

It was concluded that attempts to extend the surge-free range of a compressor or reduce the magnitude of the pulsations must be done on the actual installation with which the compressor is to be used.

Reduction of the positive slope of the compressor characteristic cause a change of the volumetric capacity of the compressor may produce the problem. The position of the compressor characteristic at which pulsations would start is a quantity which is relative to the net. In fact, one needs a qualitative analysis of surge with the methods commonly used for dynamic analysis of electrical circuits. However, no experimental methods were suggested to aid in prediction of the surge point.

► **Predicting Surge.** For simple systems which have no resistance or distributed volume (long pipe lines) between the compressor and the surge detector volume at the reverse, the dynamic characteristic slope can be predicted from qualitative considerations.

If the flow rate were suddenly increased at the system, the pressure at the compressor outlet would not increase instantaneously, since with an undisturbed volume of constant free volume, the dynamic characteristic introduced in Ref. 6) there is no increase in pressure required for the increased flow rate to be received.

The present research indicates that the accumulative volume lets up, but instantaneously the slope of the characteristic is zero, since instantaneously $\frac{dp}{dv} = 0$ is the instantaneous slope which determines the stability criterion.

If the system is to be analyzed, it is not simple, but has a length of piping which contributes distributed or volume and flow resistance to the circuit between the compressor delivery and the reverse volume, then the dynamic slope must have to be determined by experimental means.

One method makes use of a rather trivial realization that the dynamic slope can be measured with no air flowing through the system initially and the value of the dynamic slope can be used for any flow rate through the system.

The exit ducts of the system should be connected to a vessel which has been slightly evacuated. All parts of the system such as throttles, piping, etc., should be placed in operating position. A diaphragm is the entrance of the system is burst and the time rate of pressure increase in the accumulative vol-

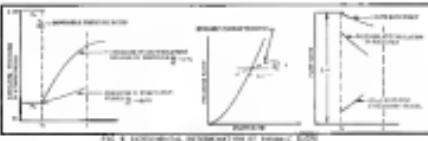


FIG. 6. A COMPARISON OF THE DYNAMIC AND ACCUMULATIVE TESTS

ume is measured accordingly.

This time rate is directly proportional to the difference in flow rate at which the accumulative volume is letting air through the exit ducts and is being filled through the burst diaphragm. The time rate of pressure increase in the system would give the rate at which air flows into the system.

Since these two measured flow rates will be the rates at which air flows into the system through the burst diaphragm (Fig. 5), the pressure ratio experienced at the inlet of the beginning of the test is the pressure ratio increment used to determine the dynamic slope. The ratio of the pressure rate increment to the flow rate into the system is the dynamic slope required.

► **Surge Prevention.** The spikes with long pipe lines connected to a centrifugal compressor in Ref. 5 is essentially the same as the type described above. In experiments with this system, the researchers found that the surge first occurred at a point on the characteristic which had a positive slope of some magnitude.

This makes qualitatively the stability criterion stated above and suggests that surge can be delayed by increasing the dynamic slope of the receiver-throttle characteristic. This is done by increasing its distributed volume and flow resistance (or in the electrical analogy, its inductance).

Still another possible solution to the problem is to reduce the accumulative volume to such a small amount that the surge frequency is so high and its amplitude is small that there is no danger in surging operation. The reverse would be an example of such an application. The surge frequency is above the audible range and the pressure amplitude is not dangerous to man.

► **Supersonic Inlet Ducting.** A phenomenon observed in supersonic inlet ducts has all the characteristics exhibited by centrifugal and axial flow air compressors during surging operation. The phenomenon has been termed "bump" because of the pulsation created during the operation. It was initially noticed by Oberleitner⁴ and he was trying the first to describe the phenomenon as "bump" or "transient resonance".

He took spark pressure (base data rate between 3 and 5 microseconds)

FIG. 6. MODIFICATION OF THE DYNAMIC AND ACCUMULATIVE TESTS

Fig. 6 all have the same pressure ratio at the flow, because the air is being accumulated uniformly through the air choke, creating losses of pressure.

If an auxiliary valve is used to bypass part of the delivered flow, curve (d) can be obtained, since the compressor is operating at point (a) but the air being bypassed through the receiver-throttle system can be adjusted to a value by the position of the bypass. This method is considerably less for regulation, but is inefficient at low flow rates, since so much power is compressed air is being wasted through the bypass.

Still another possible solution to the problem is to reduce the accumulative volume to such a small amount that the surge frequency is so high and its amplitude is small that there is no danger in surging operation. The reverse would be an example of such an application. The surge frequency is above the audible range and the pressure amplitude is not dangerous to man.

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Multi-engine aircraft shown being tested with 30-122 rating demonstration at Loring, Me.

UTILITY

Whether carried vehicles or a huge, half-track personnel carrier, hay for manured lawns or litter for evacuation of wounded, transport of replacement escape to forward areas or personnel to rear areas, loading and unloading will be simple—safe, speedy delivery assured.



a level, rather than inclined, attitude.

Since the auxiliary engine provides the thrust which normally would be supplied by the motor, the feathering apparatus of the engine set motors, consequently stopping of the blades is also eliminated. And reduction in stopping affords reduction in vibration from this source.

► **Virtues Planned.**—The proposed multi-engine version is proposed at an emphasis obtaining scaled fuselage and with wings, the former having two spars.

The aircraft would be powered by two 375-hp Lycoming engines carried above the wings and driving both a two-blade and propeller, with radio to the rear through strengthened struts. It is anticipated that the configuration will be capable of single-engine performance in a helicopter.

At low speeds and for landings and takeoffs, the craft would perform as a helicopter, with the pusher propeller declinable. But in forward flight, propellers would be engaged, the ring picked up left to reduce the radio, and the anti-torque engine less effective. With rotation complete, the upper portion of the left propeller would be covered by the wing, the entire functioning for lateral control only.

► **Costs At 150.**—Normal gross weight is expected to be 6,000 lb., cruising speed, 150 mph at 2000 ft., top speed, 162 mph. The craft is projected to accommodate 8 fifteen- or fifteen-space for 9 passengers in addition to the two crew.

At maximum gross of 7500 lb., it would seat 16 passengers.

The design features clamshell doors at landing gear, together with revolving doors, and a large and power-hungry load lift at heavier gross.

Mounting of the engines instead of the fuselage will improve aerodynamic characteristics, providing for greater passenger comfort.

And because of the unusual engine configuration to be employed, storage of the craft will be facilitated with the blades aligned in the fore-aft position.

Overall height of the configuration would be 15 ft., total diameter, 30 ft.; fuselage length, 20 ft.; wing span, 28 ft. Maximum airspeed would be 170 mph, 50 ft. 8 in. wide, and have a 6-ft. 6-in. side.

Production plans are not yet complete, but the company expects to have an initial service prototype ready before end of 1958.

A test-flying program of the craft having a 25,000-lb. gross, is being planned in cargo-hoop camion-helicopter loader planes, with cruising speed estimated at over 200 mph.



Stages in forging twelve blades



Blade forged from iron powder



Parts produced from metal powder.

Factors In Gas Turbine Blade Production

Study of methods for creating variety of blades show benefits for each, but choice may be narrowed.

In the event of a national emergency, it is probable that over 70,000 aircraft gas turbine engines per month would be required.

Amongst the first four factors of those would have fuel flow comparison, the variable quantity of compressor inlet and stator vane would be about 25 and 10, respectively, blades about two inches, and nozzle area would number about 13 inches.

It is apparent that this large volume of blades could be obtained only by processes going maximum productivity. Such processes should require a minimum of initial materials, maximum of labor (skilled and unskilled),

and space. Equipment needs should be studied carefully, particularly in to avoid rapid expansion of facilities and tooling and tool life.

Major processes of manufacture for blades and vanes are being pursued presently, and probably one or two of these methods will emerge, with the best balance of all factors involved. It is likely that all will be used to some extent for production of certain parts for which each is suited particularly.

► **Forging.**—The last factor used in U.S. production of engines were made from comparatively rough forgings, made by hand-pulling and drawing to an approximate shape of the desired final shape.

It was soon apparent that the original forging process was not good enough.

The hand-pulled part, and greater effort was directed towards meeting the finished-part dimensions by the forging process.

This effort resulted in forging to

tolerances profoundly inferior to in the industry. For example, trailing edges of 300-540 in. previously were machined for least of precision, but trailing edges of 305-512 in. are now in regular production.

Alloy castings are being held to within ±0.01 in. of the casting line.

Promising this work, has been in development in forging techniques, the process and the contractor that has solved needs to a precision figure.

Great portions of blades and vanes used to date have been made by the forging process, and for blade production in mass or war it allows a broad background of experience, good repairability, low cost and reasonably fast output.

A criticism of this process is that it requires heavy equipment and somewhat large quantities to start, since the U.S. gas turbine blade averages 10,000 lb. to 15,000 lb. per piece and the market totals 15,000 to 20,000 pieces. Eventually, present methods of cast production will have reduced greatly the amount of skilled labor necessary required. However, a high degree of skill continues to

be required in the operation of the jet.

► **Cast-Wax Process.** Many types of compressor and turbine blades are made by the well known "lost-wax" investment casting process and this method has contributed greatly to the jet program.

Using alloys which could not previously have been machined or forged, particularly Vitallium, large quantities of turbine blades and vanes have been made from high temperature materials.

This process is less adequate for small parts, both from the standpoint of cost and tolerance, but large turbine

blades and nozzle vanes have been made in quantity.

Reinforced plastic is excellent for small parts and wholly acceptable in turbine blades and vanes. The method is best suited to solid parts, although woven fabric parts with simple interior structures have been made.

The process is more expensive than forging and does not permit the precise grain size and dimensional control possible with investment forgings. However, this method is a good way of making parts of non-ferrous materials which is useful for small quantities of non-ferrous parts, since the properties

does not made more quickly, usually, than dies for forging.

► **Machining-Machined.** Blades have been widely used in the past several years. The usual process depends upon depleting the form of a casting from an extreme forging, using one of the common methods of machining or grinding.

Generally in most other processes, the cost of forming device is usually the first machining operation on the forging and the cost is lowest, increasing as the cost. There are several advantages of machined parts of solid cast or sheet, low cost as well as small, in relation to the cost.

This process has gained popularity with simplified inspection procedure. However, warpage and deflection during machining can occur, hence the method presents problems unless tolerances are adequate. Machined blades are generally polished in a smooth finish.

Cost of these parts is usually greater than those made by other processes and, in view of the strong trend toward lower costs in jet and aircraft engine production, the method may not be widely adopted. For high production, it would require a large quantity of machine tools, always a severe problem to set aside.

► **Fracturing.** Fractured blades are made by breaking them stock, with or without welding to complete the section. The Germans made wide use of this process to achieve economy of material and weight, and, in some cases, to permit re-use of the blades. Large numbers of nozzle vanes have been made in this way by the method.

Most fractured blade materials have been in the low-alloy group and, at operating temperatures increased, many fractured parts were replaced by casting of high-temperature alloy.

Required interest is low cost, light weight and no cost, together with the development of high-temperature alloys in sheet form, provides to cover the use of fractured parts.

In this process, the designer can do much to assist the manufacturer, since it is obvious that low twist, single-surface parts can be made very readily. However, it is possible to produce blades having considerable twist and of varying airfoil section and wall thickness where such design is necessary. This is a typical case, however, in which the designer design will be the changes and performance tests must dictate the design.

Development of fractured blades for the compressor and turbine may have a very beneficial effect on an extremely production program because parts exposed to light, there is little waste of material, development of processes and dies is usually possible for high production.

Two metals for high temperatures

INCONEL INCONEL "X"

Offering exceptional hot strength and high corrosion-resistance, these high-nickel alloys solve aircraft "hot-spot" problems.

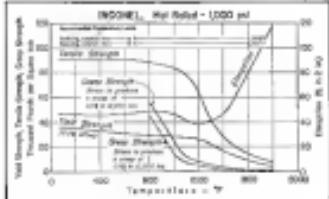
The extremely high temperatures generated within jet and gas-turbine power units are among today's most challenging aircraft engineering problems.

Relatively few materials are able to withstand the destructive combination of high temperatures, corrosion, combustion products, and high stresses. Still further complicating the problem—many otherwise satisfactory materials are unsatisfactory either because of high cost or inherent lack of workability.

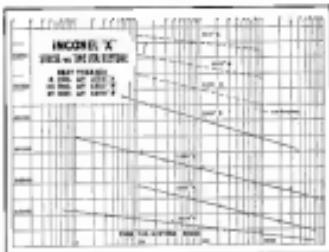
Among the few materials to show satisfactory performance in jet and gas turbines applications are Inconel® and Inconel "X"®. Both alloys have excellent resistance to corrosion and destructive oxidation at temperatures up to 2000° F. Both alloys are workable. And both alloys are practical in cost.

Inconel serves best where a high degree of oxidation resistance is required and where moderate hot strength is sufficient. Typical applications are—jet burner liners, exhaust systems, heater combustion chambers.

Age-hardenable Inconel "X" offers much higher hot strength up to 1900° F., in addition to oxidation-resistance, making it useful for turbine wheels, turbine blades, high-temperature structural members and fastenings, and for springs up to 1000° F.



INCONEL provides an unusual answer in high-temperature metal problems where moderate hot strength is adequate.



INCONEL "X" is age-hardenable and offers exceptional mechanical properties as well as high resistance to destructive corrosion.

Write, today, for full engineering information about these hot-defying alloys. And remember... our Technical Service Department is always ready to help you solve metal-selection and fabrication problems.



THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N.Y.

APRIL 19, 1958
1000°F. TENSILE STRENGTH OF INCONEL
AND INCONEL "X" ALLOYS

A NEW MICRO DOUBLE-POLE DOUBLE-THROW PRECISION SWITCH FOR AIRCRAFT



This new MICRO precision snap-action switch provides a double-pole, double-throw circuit in basic switch size. The snap action is designed to provide simultaneous operation of both poles regardless of the speed of actuation.

At 28 volt d-c, it provides a capacity of 5 amperes, inductive load, per pole.

A complete line of housings and actuators is available for use with this new switch.

MICRO... first name in precision switches

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Portland • St. Louis • Dallas • Toronto



INCONEL...for long life at high temperatures

The end is only the beginning

As these words are written, the twin-jet *Cudass*, Vought fighter airplane, is seeing the end of a long hard trail of research, design, development and test.

For 32 years Vought has built conventional airplanes of proved design for the U. S. Navy. The *Cudass*, however, was completely new — a radical departure from Vought's time-tested fighter aircraft. It has no tail and it does have sweep-back wings, two logical developments which posed problems Vought engineers never before had faced.

The *Cudass* is Vought's first twin-engine jet fighter. To save weight, the engineers incorporated more magnesium in its airframe than in any previous Vought design, and made extensive use of Vought's lightweight "sandwich" materials. To overcome the forces of high speed flight, they provided hydroelectric boosted elevators (combining elevator and aileron functions) and incorporated artificial "feel" to simulate the control forces the pilot would encounter in conventional aircraft. And, finally, they created an airplane that would have



The Vought F7U-1 Cutlass twin-jet fighter, Insert and front is a long line of Vought airplanes that have played well their part in maintaining American air superiority.

superior speed and performance at high altitude, yet handle effectively at low altitude for carrier landings.

These experiments and many others in this advanced aircraft design offered a lot of challenges. But, they are about ready to pay off — because the *Cudass*, which in 1945 was only a gleam in a designer's eye, is emerging as one of the nation's top fighters.

It is fast — as fast as they come. Its rate of climb is meeting and exceeding performance requirements. It is highly maneuverable even at speeds in the neighborhood of the speed of sound. It has the fire-power to deliver a telling blow in combat. It is equipped with the finest and most modern in radio, navigational aids, pressurization, instruments, hydraulic controls and other cockpit equipment. High-wise, the *Cudass* has proved to be a pilot's dream.

Now, it is ready to start down another long trail: production, refinement and aerial service in defense of the nation.

Yes, the end is only the beginning.

CHANCE VOUGHT AIRCRAFT DALLAS, TEXAS

One of the four divisions of
UNITED AIRCRAFT CORPORATION

SPEED

Top speed of the *Cudass* is a military secret. But here's a hint: — it's in the "over 650 mph class". And, it's not a one-atack fighter. At four hundred feet or at forty thousand, it will compete with anything in the sky.

MANEUVERABILITY

The *Cudass* can execute any aerobatic maneuver: like a stalled pick-up-tilt. At one mile up, or eight, it can outmaneuver any existing bomber or fighter — and easy inside it.

RUGGEDNESS

Severe storms has been built into this newest Vought fighter. Severe and rugged trials have been imposed on it and it is already evident that the *Cudass* is endowed with traditional Vought ruggedness. The *Cudass* can give it — and take it.

NEVER TOO MUCH...NEVER TOO LITTLE
BUT **ALWAYS JUST RIGHT**

because of
TOLERANCE CONTROL

Another reason why industry prefers **SKF**

Remember leaping? How you used to have to skin over just right? Well, it's very much the same there in specifying bearings. You don't want tolerances too great... and you don't want tolerances closer than the job demands. But you want to be sure that tolerances are right...are always properly controlled...always meet established standards...now adhere rapidly to these standards. Continuous vigilance in every stage of production assures complete control of tolerance throughout the entire manufacturing cycle. You can always be sure that **any** **new** bearing will exactly meet your requirements...and will meet them again and again. Never forget, either, that tolerance control is only one reason why **new** bearings will help you build equipment which, through smooth, economical performance, helps develop greater acceptance for your product. **SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.**

SKF
Ball and Roller Bearings



Inventors and Pioneers of the Self-Aligning Ball Bearing
and Spherical Roller Bearing

100

ton and only moderately skilled labor is required after protective coating has been developed.

► **Powder Metallurgy**—In this process powdered iron or steel of crushed cast iron is melted to shape in presses at approximately 1,700° F. The powder is melted so that it can be melted at about 2,000° F. to produce a stain-plate and later cooled in the pressure-cooked compact ingot.

At this point of manufacture, no annealing is employed—the pre-enclosed part is reheated to about 2,000° F. to react with a copper alloy in a special atmosphere furnace. The copper alloy is melted and absorbed into the powder iron compact, largely by capillary action, producing an almost 100 percent dense part. In this step, alloying of the iron by the copper occurs and a heat-treatable iron-alloy is formed.

Continuous rotation is required to ensure proper blending as provided by rotating about 0.015 in. per sec. For this reason, magnetic levitation is used to determine the availability of a metal choice that is capable to reflect the dimensioned case to lower the cost. The continuous assistance afforded by chiseling or electro-tapping is superior to the standard Type 434 stainless material.

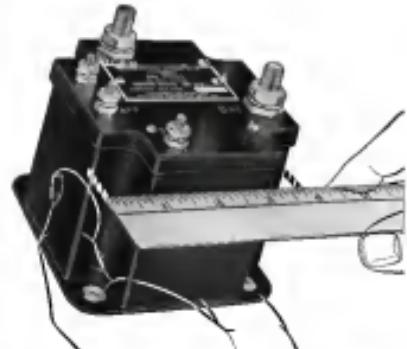
Ultimate strength of the powder part is approximately 180,000 psi. This is less than standard blade materials, but extensive engine testing has proved the blade order sufficient.

To date more than 900,000 seal face compressor stator cases have been made by this process for a current production jet engine. Test work on the use of powder metal for compressor rotor blades is in progress.

► **Powder Method Benefits**—While this process is capable of low cost and the use of associated materials, this process also requires only 250-ton standard presses, small working area and has demonstrated a long life.

Using this method, 110,000 blades per month can be made in 12,000 sq. ft. of manufacturing space. Melting and casting then is currently made of conventional cast steels and is giving a life of 75,000 to 150,000 pieces. Cast blades are probably well yield 750,000 to one million blades. Excellent re-machinability of dimensions is indicated by this long life.

Working tolerances are generally +0.000 to -0.005 in. for a tolerance of .005 in. and +0.005 in. deviation from the certified C.G. limit. Surface finish obtained with the thermal case is 90 RMS maximum. Powder metal blades with fine finish are much smoother than the casting surfaces because the surface discontinuities are irregularities between grit particles rather than the usual "hills and valleys."



Measure of Acceptance

Superior performance within the same size and weight limits is just one of the reasons why Hartman A-703A™ Reverse Current Circuitors have made obsolete the fixed voltage types formerly used...why today they control over military and transport aircraft generators, then up to 2500 rpm—for longer service life, lower maintenance cost. Contact replacement is unusual.

Designed to close and differential voltage between generator and bus bar, thus at a fixed voltage, the A-703A circuit is free from all contact chatter. Touchstone rectifiers and current-limiting ballast tubes have been eliminated. The A-703A circuit operates with any dc generator up to 300 amper capacity having a normal regulated voltage of 25.5 volts, 600 rpm, with the inevitable.

*Manufactured to AN3025 (Spec. MIL-C-5010). Literature on request.

the Hartman Electrical Mfg. co.
MANSFIELD, OHIO



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NEW AVIATION PRODUCTS



Disk File

New type of disk file developed by Kressmeyer Inc., Litchfield, Ill., has an arc with two fingers, notches and grooves, is reported to provide faster, less costly operations, such as in swinging cutters, cutting off flanking, facing and preparing up surfaces, etc., commonly performed by hand.

Frictional pressure of hard Kressmeyer (90.1 Rockwell) A is applied to face of steel back-up plate in number of courses, to form many sharp, evenly, cutting edges. They are sharpened, grouped, and purchased in 16 pieces 10deg negative axial side, 30deg clearance angle, and 10deg negative radial side.

Construction is intended to afford maximum efficient and free-cutting action. Material is removed in single chips, with no abrasive dust. And it is claimed that smooth, true surface is produced. Economy of continuous courses of greater number, uniform cutting action and use of carbide. When files are used to remove under cut, with abrasive wheels, these edges disengage but cut cutting.

Four sizes are 6, 8, 10, and 12-in. diameter. Units may be mounted on grinder, abrasive disk machine, motor end, or disk file machine with suitable adapter. Recommended speeds range from 5000 to 7000 rpm for hard materials, and 8000 to 9000 rpm for soft or greasy materials.

New Tool Steel

Recommended for such applications as blank extrusion, drawing blocks and dies, valve extrusion die inserts, forging die stems, forging press dies and hot punch tools, a new metal, specifically designed for hot work, is announced by Allegheny Lallemand Steel Corp., Pittsburgh, Pa.

Marketed as B-47 hot work steel, it

is a combination of chromium, tungsten, cobalt, vanadium and molybdenum, proved in hot and cold tests to have high resistance to shock and abrasion at elevated temperatures.

Although hot hardness prevents alloy to do many severe hot work jobs well without work hardening and grain growth, it is specifically recommended for applications requiring good toughness of relatively high hardness, or where ultimate resistance and resistance to heat checking are important factors.



Absorbs Noise

Small, sound proof boards in which to mount instrumentation equipment usually affected by low noise has been developed by Farnham, Inc., 415 Lexington Ave., New York 17, N.Y. Called Model M-15, and at 16 in. wide, one section, and lined with acoustical insulation board. Outside dimensions are 131 in. high and wide and 113 in. deep. By placing the instrument station at the sound source, a high percentage of bulk sound waves experienced in shop are minimized.



Gate Valve

Adaptable for 75 psi aircraft fuel systems, small, lightweight gate valve (shown with electrical actuator), developed by The Parker Appliance Co., Cleveland, Ohio, also is available for service with high-temperature air, for

oil, water-alcohol mixtures and other fluids.

Fabricated in sizes of 1/2, 1/4 in. (11 lb.) and 2 in. (23 lb.), units are made of welded steel sleeveless body halves, utilizing high pressure for sealing. Pressure-balanced seal does away with bypass valve and the maximum operating pressure is reduced.

At zero pressure, there is only light spring pressure on the floating and interlocking specially compounded, flexible, synthetic rubber elastomeric material used rigid metal constraint. With low loss after closing, low pressure acts on both sides of the seal, with only sufficient differential to accomplish a positive seal against gate.

Positive balancing is intended to eliminate problems normally encountered in synthetic seal, resulting from seal stick and cold flow effects. Minimum and maximum pressures and closing at closed position, in open position, and in two gate gate, allowing for simple dry storage without special care.

Advantages reported from use of synthetic rubber seals: Wide temperature operating range, -65 to 135 F., low friction, and resistance to wear caused by explosive fuel.

Valve operates at pressures of 6 psi maximum to 75 psi, with low pressure drop—1.07 psi at 100 gpm for the 1/2 in. size valve. Seize pressure is high at 150 psi are accommodated.

Welded valve body eliminates metal-to-metal static and at potential source of leakage. Shaft and gate seats are stainless steel, stainless and molybdenum without special tools. Gate seats are fully machined for positive seating without bending or warping.

Valve is adaptable to manual operation, push-pull remote control, or electric operation using actuators developed in any of several types. Optional thermal relief can be provided to bypass flow in the event of pressures of 80-90 psi or higher.

Valve opens and closes in 1 sec with usual operating beginning on radio noise filter, but 2 to 5 sec. period can be provided by slow speed models to avoid surges.

Small Capacitors

Minister tablet capacitors, Type P-85, offered by Amico Corp., New Bedford, Mass., has Amico's unique rated paper section, hot-wire tested with Duane's Rounding "backlash" paper-faced tablet is chosen to offer heat and humidity resistance qualities associated with plastic devices, but at less cost. It can be used at 212 F. with over 1000 hrs., and dielectric strength is maintained at elevated temperatures.

"MASTER" JACKSTACKER IS LEDEX EQUIPPED!



LEWIS-SHEPARD Chase LEDEX ROTARY SOLENOIDS for RUGGEDNESS!

Lifting, lowering, moving and striking these and four thousand pound loads day in and day out, rugged, heavy-duty equipment. Just as important, these are the new LEDEX Rotary Solenoids buried deep in the heart of the "Jackstacker's" powered hydraulic lifting mechanism. The flow of oil in the hydraulic lifting mechanism is controlled by these two incorporate Lewis-Rotary Solenoids, valve-geared completely in hydraulic fluid.

The same ruggedness required for this product is available for power. The five versatile sizes of Lewis-Rotary Solenoids may be found in many production applications from automotive controls to aircraft fire extinguishers to automatic lawn sprinkling systems.

We supply to quantity users and advise the opportunity to be of assistance in engineering a Lewis-Rotary Solenoid to meet the demands of your product.

Write today for LEDEX ROTARY SOLENOIDS
EATON ENGINEERING DATA

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Purchased in 1954, this International D-54 has hauled every day since then except for one brief winter. It's a prime example of how power tools today can do the impossible and jobs such as illustrated, moving a 20-ton lathe during the early days of a steel structure "V."

Airport Handling 50,000 Airline Passengers is Year Keeps Shipshape with International-powered Equipment

Because the International tractor purchased in 1958, proved to be so reliable and dependable at the Rochester, Minnesota, Airport, a fleet of International tractors and International-powered equipment is now active on the "Run."

The International "D" tractors, with power bars for maneuvering areas, and plows for snow removal from runways and walks, a Formax "M" for forming perimeter areas which yielded 1000 bushels of wheat in 1956, a motor grader and a rotary snow plow, both powered by International diesel, comprise this fleet. Obviously, Rochester finds that International Power pays off through its dependability and long-term operating economy. See your International Industrial Power Distributor and get the power that pays on your equipment.

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SALES & SERVICE

New Plan for Aircraft Insurance

St. Louis firm making every fixed-base inspection station in effect to make coverage cheaper, simpler.

A new weekly in aviation insurance, aimed at simplifying procedures, may pay off in increased business for fixed-base operators and lower cost to private aircraft owners.

National Insurance Underwriters, St. Louis, Mo., is offering every fixed-base operator in the country an all-inclusive inspection station. These stations will consist of a small office, a lounge, a break room, a snack bar, and a service bay. They will be owned by private and NU principals. Here's what happens:

► **Easy Payment**—NU is offering every private aircraft owner in the U.S. that his fixed-base operator can perform the inspection, and attaching a simple self-issuing application for insurance. After filling out the form, the owner takes it to his fixed-base, who answers five questions and returns the blank to the owner. Only half the annual premium is required by NU when the application form is returned. When first premium payment is received, the final base operating fee of \$100 goes to NU.

Advantages of the system appear to be low private plane owners and fixed-base operator. Rates for the insurance are considerably lower, since annual premium payments cut down the amount of initial cash needed to set up place, eliminate claim adjustment if possible by using the inspection stations for claim service.

NU thinks the fixed-base operator will profit under the plan, since he will receive payment for the inspection, aircraft parts, material, will increase when insurance costs less and the aircraft maintenance, service and aircraft sales potential will be higher as new owners become acquainted with the operator.

► **Rates**—Insurance rates at NU appear to be comparatively low. Typical charges:

• **Passenger liability**, \$110,000 policy limit, annual premium \$344.

• **Property damage**, \$5000 policy limit, annual premium \$726, \$10,000 policy limit, \$825, \$15,000 policy limit, \$892.

• **Passenger liability**, \$5000 policy limit per seat, two-plane aircraft annual premium, \$11,850; two-plane aircraft annual premium, \$16,15, \$10,000 policy

limit per seat, two-plane semi-annual premium, \$37,75, four-plane semi-annual premium, \$58,55.

National Insurance Underwriters, according to D. W. Katz, president, was formed in 1945 by a group of fixed-base operators as a non-profit insurance company aimed at reducing the cost of aviation insurance and improving the service. It currently has in force over \$35 million of aviation insurance.

SA Invites Customer Criticism

Southwest Airlines at Dallas this year is reporting in its issue of reading material a letter inviting comments and criticisms on SAC service. With such letter as a form headed "Show Us What You Think" in which the customer is asked to put down his frank opinion. A stamped self-addressed envelope is enclosed.

Concerning letter states: "As a result of many years of experience in the airline business, we have given the 'gift' of our airline to others for use and thereby made a number of naturally helpful changes. Naturally, we're proud of Southwest Airlines' constant expansion and progress in the field of customer service, convenience and punctuality, but we're the first to admit that SAC's not perfect. We always have profited from ideas advanced by our customers and credit these friendly critics with much of our success."

Southwest plans to use the letter as annual custom.

Copter Hunts Tuna

United Helicopters, Inc., Palo Alto, Calif., has sold a power-equipped Hiller to a tuna boat owner, operating what the company thinks is a new and outlet for its aircraft.

Sale was made after a phone-contract in which the copter proved successful in locating schools of tuna and had to allow a record catch in about two-thirds the time of previous voyages.

The San Diego fleet, with more than 100 boats large enough to accommodate a helicopter, tried boat planes previously, but found the slow hovering characteristics of the rotary craft more suitable for the job.



HILLER 360 CONVERTED TO AIR AMBULANCE

Two of these United Helicopters, Inc., air ambulances have been sold to the French government for use in search and rescue operations. The G-44-powered craft are converted Hiller 360s which have been modified to pick up patients in inaccessible areas. A crash-protected stretcher is mounted to each side of the helicopter and connected with the cabin. Cabin doors face out and around the front end of the blade. The

patient need not descend during flight. A demonstration flight in San Francisco recently showed the advantages of the air ambulance in difficult rescue work. A Hiller 360 converted to an air ambulance was able to land over a five-mile ocean. The helicopter, packed up the same of the "accident," picked up two patients, and returned in approximately one quarter the time required by the ground ambulance.

Customer Delivery

Danvers Stephen Charles Seaton is helping a Tacoma, Washington, lumber broker do business the easy way. Previously to work at his waterfront home rather than a downtown office, the lumber buyer thought it a tribute to his customers to let them do the talking. The same old words for welcome guests

Justice Dept. Hits PAA-AOA Examiner

The U. S. Department of Justice last week stepped into the middle of the Pan American Airways-American Overseas Airlines merger case with sharp criticism of the court's American Board of Examiners' report which received approval of the deal (Aviation Week, Jan. 2).

Justice Dept. attorneys launched their attack by questioning the propriety of permitting Examiner Thomas Wren to sit in on the case. They noted that Wren was examiner in the

engaged North Atlantic route designated in 1945—and at that time had recommended against certification of TWA, which now opposes the merger.

Examination is taken to what appears to be the intent and purpose of the court in the certification of the proposed Pan American and American Airlines," the Justice Dept. declared. It added that the report is "replete with statements of certain statements of intent to the public interest and established national policies."

The Justice Dept. said Wren had failed to investigate and ignore all allegations of false testimony by proponents of the merger. It charged that the

examiner failed to give proper weight to a vast accumulation of evidence bearing on TWA's alleged monopolistic practices.

Whichever Wren found that negotiations leading up to the merger agreement had been "prolonged" or "unusually long," the Justice Dept. said, conversations on the ADA side were secret and suppressed from certain company executives.

According Wren of evaluating PAA's alleged monopolistic practices, the Justice Dept. called for a finding that the proposed merger will result in competition, possibly another carrier (TWA), and eventually result in establishment of a monopoly. It declared that the proposed North Atlantic route pattern to be established by CAB and the Post Office in 1945 for a specific ten-year period and should not be abandoned at this time.

Seaboard Files Ocean Cargo Brief

Trade between the U. S., Europe and the Middle East totals nearly 74 billion lb. in value, and 685 million lb. of this is potential air freight. Seaboard & Western Airlines spokesman have told the Civil Aeronautics Board.

Certification of an unenclosed all-air freight air carrier on the North Atlantic route would make possible carriage of 8.2 million lb. of traffic during its first year, or just 1.2 percent of the air freight potential represented by 560,000, the carrier claims.

► **Cargo Needs—**In a brief supporting its application for a certificate of public convenience and necessity, Seaboard claims it has created a substantial backlog between the west it seeks to serve and any of the certified airlines. It claims about that an 1948 Seaboard & Western transported 1,369,301 lb. AOA, 118,377 lb. in Pan American (Atlantic division), 1,119,230 lb. TWA, 1,178,139 lb.

Now operating under CAB's frequency and regularity requirements, Seaboard says it has carried more than 11 million ton miles of freight and made over 1800 crossings in the North Atlantic during 73 months of operation.

► **Routes Sought—**Seaboard's request authority to operate a transatlantic service to western, northeast and central Europe, and the Middle East as far as Saudi Arabia. It also says it proposes to pack air freight for international carriage from points along the Atlantic seaboard and from the Great Lakes area, with terminal points of Boston, New York, Newark, Philadelphia, Baltimore, Chicago, Cleveland, Toledo, Detroit, Cincinnati, Detroit and Buffalo.

TWA Makes Its Bid For Holy Year Traffic

TWA is warming up to the battle for Holy Year traffic in Europe by offering all-expense, trans-Atlantic air fares at present underwriting these personally arranged by Pan American Airways and non-scheduled operators.

Pan American, under a charter agreement with TWA, a Caribbean charterable organization, has prepared a \$695 New York-Rome "package" air fare with 10 days in Europe. Non-scheduled fares, under agreements with Holy Year Pilgrimage, Inc., are being arranged for continental \$600 roundtrips, all expenses. Fares between New York and Rome if it can get exemption for the flights from the Civil Aeronautics Board.

► **Choice of Tours—**But now TWA, in cooperation with the Bureau of Catholic Travel of Thomas Cook & Son, Inc., is offering a \$635 all-expense Holy Year tour which provides for two weeks abroad, with stops to Lourdes and Paris, en route to Rome. A second newly announced two-weeks TWA package will include Rome, Geneva, Milan, Florence and Paris for \$605.

For persons with very limited time to spend abroad, TWA has a special one-week, all-expense tour to Rome at \$597.

The regular roundtrip rate for air transportation alone between New York and Rome is \$747.

► **Trans Line—**All of TWA's new package fares are available immediately, but travel must be completed by May 31 under the special 15-day-hold extension for agreement of the International Air Transportation Association, which provides for all routes, roundtrip one of our and non-stop the regular one-way fare (Aviation Week, Dec. 19).

Promotional travelling in TWA's all-expense tours will receive regular rates that are not negotiable. They will be furnished with round-trip transportation abroad, accommodations at first-class hotels, meals, admissions fees, and entrance fees to museums and other places of interest.

► **PAA Attack—**TWA's tour program is especially significant in view of Pan American Airways' recent statement that TWA is attempting to "silence" Pan out of Rome for the Holy Year in the hope of luring pilgrims to use TWA's larger, high-speed service.

The sole U. S. big line represented in scheduled service to Rome TWA has filed a court injunction to prevent PAA from opening its Pahn Roma flight route. The PAA New York-Rome flight has been delayed, and action on the court injunction has been withheld pending a decision of

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CAB's position in the matter [AVIATION WEEK, Jan. 2].

PAAs explain that TWA will be unable to meet the demand for air transportation to Rose during 1958 and that if Pan American's charter arrangements with the airline are repeated, the planes will not be transported to the consolidated airline "whose load factor rate in 1948 was over 15 times that of the scheduled airlines." PAA estimated that between 150,000 and 300,000 American Catholes will go to Rose this year, adding that seven paved runway accommodations have been sold out.

Air Lines Irk Mediation Board

Continued from page 12 of the National Mediation Board's help in settling labor disputes before last educating direct collective bargaining a director at U.S. air lines in NMIB's 1957 annual report just released.

"In too many disputes," the report said, "the board is called upon for mediators to assist in cases involving the making or changing of complete agreements. Such requests reflect the failure of the parties to settle their own争端 by negotiations directly."

"On the other hand, mediation is in order only after the respective当事方 negotiations fail to produce a settlement. Mediation should not be requested in cases where the parties have made only a partial agreement to settle their dispute."

The report acknowledged that the air transport industry is expanding rapidly and therefore has not been able to absorb the stability in labor relations experienced by the railroads.

The 63 air line mediation disputes during the year ended last June 30 represented only one-fifth of the total number of mediation cases handled by NMIB, yet they occupied the largest share of NMIB's mediation time. The indications of a marked beginning in revenue air NMIB intervention, the report asserted. The board also benzeneated the picture developing as air line labor relations of appearing in renewing contracts every year.

The number of air line bargaining disputes before the board has increased every year since the war. There were 15 in 1946, 38 in 1947, 50 in 1948 and 63 last year.

There are 18 strikes occurred during the fiscal year.

• The last half of the 19-month pilot strike against National Airlines, which ended Nov. 26, 1948.

• A one-day strike by flight radio technicians against Pan American Airways last April 1.

• A brief, unauthenticated wildcat strike against Colonial Airlines.

There were two emergency bands one in the National Airlines dispute, the other involving Northwest Airlines.

Six arbitration awards were handed down involving Braniff (sweet), North West, Capitol, Missouri and Wisconsin Central.

There are 224 air line labor contracts on file with NMIB. Eleven are with local unions, 49 with system associations and 161 with national unions.

U.S. Jet Studies Are Non-Standard

American Airlines' Vice President engineering, William Letherford, speaking recently before the Society of Automotive Engineers, gave this description of what happens when he arrives from the British Jet Show in Farnborough, September, 1949:

"Usually last my office opens for business the day after my return from Farnborough, thus the bell starts ringing steadily, and my secretary announces a series of telephones whose lines and buttons I had not seen for some time."

► **Just as Paper**—Each produced a sheet of very general specifications and outline drawings of aircraft, all of which, singularly enough, were powered by jet. There were little photos, big planes, blueprints and blueprints, plates with and without sweep-back, all types.

"I could not help but recall the occasions and places since immediately had others have helped on the operations at these principally responsible for the lack of standardization in transport aircraft. If these barely covered jet transport designs or any reasonable portion of them—ever get revised or welded into strict form, you will behold the greatest conglomeration of non-standard designs ever!"

PAA Furloughs 146 Pilots

Pan American World Airways has furloughed 146 pilots as a result of a financial hitting off its business, the first move in this direction by the carrier since the war.

Since 1945, PAA explains, it was able to continue the seasonal drop by state expansion waves. But in 1949, with right exception, the company showed little change in this direction. Pan Am's loads were in accordance with projections contained in its contract with the ALEX. The 146 furloughed pilots were now advertising in New York and Chicago newspapers for non-senior pilots.

American, TWA, and United also have furloughed pilots since last fall.

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Widow Files WAL Crash Suit

A damage action for \$103,387,000 against Western Air Lines, Inc., was filed yesterday in Superior Court, San Diego, Dca. 22 by Mrs. Elizabeth J. Bright, of El Centro, Calif., as administratrix of the estate of her husband, Fred B. Bright, Jr., who was killed in a Laguna Beach plane crash Christmas Eve, 1946.

The action charged Western Air Lines with faulty and negligent operation of the plane. The complainant alleges that Bright was 24 when he was killed. It said he had a normal life expectancy of 34.2 years more and that he was capable of earning \$30,000 yearly.

Delta Passenger and Freight Business Up

Delta Air Lines will show a 13.5 percent increase in passenger business and a 21 percent increase in freight for 1948, it was announced by Laing C. Pitkin, vice president of traffic and sales.

It is estimated that Delta will have carried 310,500 passengers in 1948, compared with 407,664 in 1947. The company topped its previous record of 303,415 passengers set in 1946.

Freight grossed \$1,000,000 in 1947, \$96,171, up \$16,162,546 in 1948, and cargo pounds were 5,001,313, up 6,519,714 in 1947.

Delta's air mail and air express loads decreased during the past six years, dropping 20.1 percent in 1948, 15.6 mail passengers were off 7.2 percent to 4,114,501 in 1948.

Miami Airport Shows Big Profit

With many new air fields still in the rear and planning higher for commercial use in 1948, Miami International Airport announced a surprising \$151,297 net profit for the year ended last Sept. 30.

The airport, which boasts the largest percentage of foreign passengers and cargo business of any field in the western hemisphere, had a gross income of \$1,284,477 in fiscal 1948. But of the income—\$771,730 was from rental of hangars, terminals and shop buildings to the airlines, but \$299,516 was derived from fees, \$127,701 from various concessions and \$75,615 from services performed for tenants.

The field, the U.S. transitfield serving Miami, Fort Lauderdale, Pan American, National and Delta—estimated their profits will rise 11 percent in the past year with 983 passengers being handled.

American, Eastern and National have large terminal and maintenance bases at Miami, and the cold climate permits them to cut expenses by doing 75 percent of the work outdoors.

Plane Expansion Underway. With aircraft production doubling a doubling of traffic within the next few years, Miami International Airport has launched a \$100 million building program. Private interests have agreed to meet a \$5 million bond-trust building. Existing runways will be extended and a new heavy-duty NW-SE runway is planned. Trunks of the Seaboard Air Line Railroad, which now bases the north-south service, will be relocated.

Between its 1947 and 1948 position among the country's international airports, the Miami field grows to the 235,416 passengers to and from foreign ports who used the field in fiscal 1948. Total international passengers at LaGuardia Field during the same period numbered 161,418.

Heavy Cargo Movement. First-half 1948 saw 16,301,963 lb. of air cargo move into and out of the country through Miami International Airport, compared with 5,977,571 lb. for last October.

The Miami field's passenger total in fiscal 1948 (with figures not yet final) was 571,460, against 514,297 for the same 1947. Air cargo totals in the first six months of last year were 24,493,000 lb., compared with 22,381,000 lb. in first-half 1948.

Two-Class Service

(McGraw-Hill World News)

West African Airways Corp. plans to offer a twice, twice-a-week service between Accra, Gold Coast, and Khartoum, Sudan, with twin-engine Bristol Wayfarer equipment only this year. Plans in the trans-Saharan link will be able to carry 15 first-class passengers, 12 second-class passengers and 44 tons of freight.

Feederline Hits 525-hp. Continentals

Difficulties leading to cancellation of French Airways in March, 1948, were caused in large part by unsatisfactory performance of Continental R-985 engines in the company's Booth D-18C transports, officials of the airline charged last week.

Appearing at a Civil Aviation Board hearing which will determine a final mail route to Florida, President Joseph L. Dyer introduced exhibits designed to show that the 525-hp. Continental in his company's four D-18Cs suffered a failure every 155 hr., whereas



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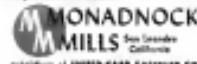
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Photograph: Left: Federal Wheel-Ski. Right: Federal Wheel-Ski with aircraft. Both photos by Federal Wheel-Ski Division.

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Monroe, N. J.

<p

STRICTLY PERSONAL

TODAY'S CONTRIBUTION TO SCIENCE—L: Conde, Robert F. *Feeling bound by the highest sort of art*. An author made of AVANTAGE, Wall, and particularly Stetson. I feel the graded article coverage is a little weak. Enclosed is a copy of a report that has been making the rounds of the internet lately. Since Reader 1 might be attached to the advanced beatitudes of the just. Lang. Rang. Pressing. General at Coros, Fla. We don't know where he wrote. We present him with us and our latest contribution to scientific knowledge.

PROGRESS REPORT ON SCORING (CONT.)

Geom No 286 was successfully launched at 10:14 Nov. 7, 1949, using the aero RS-2 (rather than) engine. The purpose of this launching was to test ignit. and stabilization under the conditions of 0.76 deg. side-wind, 10 percent humidity, 76 deg. F. temperature, and 29.86 in. baro. pressure.

Elevators were set at 50 deg. as stiff tubes at 21 deg. Radders were wavy and wavy. The new Brewster Mk. I bomb was installed in a sprung mount, load-coupled, and had box of rubber. Manner type of tritium lighting was installed. The canopy was recessed, although it was rifled into a half the size of a swing, and the fuselage was compact, cased, and bullet proof approximately .300 pieces. Bombs are being compiled, however, and a report should be forthcoming early in 1943.

Beeper ignition occurred presumably when the guard at No. 5 Gate inadvertently switched on his table radio on a frequency of 1712 kHz cycles. Steps are being taken to keep all station radios off this frequency on the barge.

The Gann quavard is placed for five seconds, moved ahead two feet, spun around twice, and then sound down the catapult at an angle of attack of 45 deg rocking an air speed of 62 mph. The Curtiss E-type 74-mm Barrage-candle booster reported clearly after landing by No. 6 speaker for seven seconds.

The vehicle was then observed to roll slowly to the left 50 deg. at the same time going into a 45 deg. turn to the right and executing a zig-zag pattern similar to the Thatch Wave, otherwise stability appeared completely unaffected.

As the missile approached the western boundary of the firing area, the Aegis class ship was ordered to shoot it down. The crash occurred 1020 miles from the launch point.

15,511 paces from the launching point. The new Mobile Recovery Unit used the Honey-Vanagon Machine Gun to fire a charge at the pincer end of a group of penguins. 12,297 penguins have been recovered and carefully examined. It is now believed that the seal-inflicted oil, salt and young was caused by a (60616) oil shear pipe when the counterweight underfired a spring later being shaken loose when the launching aperture suffered a spasm of constricting. Steps are being taken to insulate any shear paces of 08817 in constricting and all launching operations have been ordered to smoke

WHAT'S NEW

New Books

"Electronic Navigation" by Lieutenant M. Orrell, USA, Col U.S. Army. In this article, the author, director of the Army radio laboratory at Watertown, details the various field of electronics related to aircraft and marine navigation. Described are new radio and television sets used for position finding, and the many new derivatives are surveyed, including the radio altimeter, RMI and CCA, the forthcoming electronic computer, PMS, magnetometers, transistors, diodes, R-Tache navigation, and British developments such as Decca.

There is a comprehensive glossary of terms used in electronics, 165 study questions with answers, and a bibliography. Published jointly by Fox Aeronautical Navigation Service, 12321 Ventura Blvd., No. Hollywood, Calif., and Witten Systems of Navigation, Annapolis, Md., 222 pages, price \$4.50.

Jet Aircraft Simplified by Charles E. Chapel explains step-by-step the basic principles and practical applications of aircraft jet propulsion in easy-to-understand terms. All types of engines are described and evaluated, including the turboprop, jet, afterburner, pulsejet, and composite engine arrangements. More than 100 jet engine and aircraft illustrations are illustrated and there is a comprehensive index. Published by Aero Publishers Inc., 2162 Sunnen Blvd., Los Angeles, Calif., 161 pages, price \$3.75 (hard cover) \$2.75 (flexible

New Literature

Directory of **Shell Airport Design** a handy pocket-size booklet listing commercial dealers throughout U.S. and Canada and giving grades of materials and grades covered. Also included is a digest of state laws affecting taxes on aviation fuels, listing amount of tax, and refund or exemption regulations for each state. Available by writing Shell (Attn: Ca. aviation department), 30 W. 42nd St., New York, N.Y.

Ballots on embedded wire resistor type of electrically heated rubber gear drive, including cost of product. And available from B. F. Goodrich Co., Akron, Ohio.

Some of five publications "Adjustable Speed", "Adjustable Speed AC/DC Motion", "Speed Variator", "Electronically Speed Variation", and "The McNeil Adjustable Speed Drive", are available by writing General Electric Co., Schenectady, N.Y.

ADVERTISERS IN THIS ISSUE
AVIATION WEEK—JANUARY 16, 1958

AVOID VERBAL OBSTACLES

TO: Advertising Dept

John L. Bechler



主编：吴国强 中文总编：蒋维森

160

LETTERS

Stall Warning & Crash

We have a report of the first element case of a study in an aircraft equipped with a stall warning system. —

Normally, it is anticipated that something of this nature should happen. It proves a classic, however, to draw some conclusions.

Since 6000-plus aircraft are now equipped with the SFT, on the average, each aircraft has had the SFT installed for a period of time now. That means 12,000 aircraft-years of flying with the SFT-equipped aircraft per family.

This compares with the established rate of one accident out of 110 being involved in a fixed-wing aircraft each year. Because of an advanced state of affairs.

The experience gained is too narrow to draw any conclusions, but it may be noted that the experience gained with stall warning devices has a stall-warning rate of 1/12,000 rather than 1/110, for standard aircraft. This would seem to be at about 180 times better.

More important, I believe, the three-year record of experience accident prevention shows that stall instruments in the cockpit, went positive method of improving the safety record.

CHARLES D. BROWNE
Stall Warning
475 Field Rd.
New York, N.Y.

(Mr. Browne sends a letter written to Dr. Lassaud M. Gross, president of Safe Flight Instrument Corp., requesting the aircraft in the SFT-equipped plane, now referred to as falcon)

On Sept. 25 an aircraft equipped with a functional SFT took off from Rose Bowl Airport for an uneventful flight to a nearby airport. An engine failure or engine trouble made it drop 160 degrees thus resulting in a two-spin and hard accident to the nose and passenger.

This could be a complete interpretation of the results of our study, in that the stall warning indicator was functioning or operating at the time of accident. This is the first fatal accident of which we have heard involving a stall warning indicator.

Mr. Morris, the last year, was a good friend of mine and the two of us flew him on several occasions as his airplane. Mr. Morris remarked that he never paid attention to the stall warning indicators on the aircraft because he had deliberately installed it so as to sound its warning at a considerable speed than might be discussed outside the aircraft.

We figure that some 75 percent of our total traffic was of medium aircraft and that, as a correlated factor, we would be able to assume that percentage to come between 18 and 30 percent. Such a measure to business would permit us to operate at a high enough load factor to obtain a good safety margin.

You might, therefore, as an answer to the question, are these facts as I have related them, namely, that the industry has been functioning, and, therefore, was deliberately set up by the manufacturer for good and recommended by the manufacturer?

The letter is signed by Walter W. Ross,

Ross Aviation Corp., 7700 N. Broadway,
St. Louis, Mo.

Small Lines Plight

As you know, *Vid-Air Lines*' leasing tank in Washington for the two weeks in July passed. I am amazed at the number of small lines who by the end of the month had not yet installed for a period of time now. That means 12,000 aircraft-years of flying with the SFT-equipped aircraft per family.

This compares with the established rate of one accident out of 110 being involved in a fixed-wing aircraft each year. Because of an advanced state of affairs.

The experience gained is too narrow to draw any conclusions, but it may be noted that the experience gained with stall warning devices has a stall-warning rate of 1/12,000 rather than 1/110, for standard aircraft. This would seem to be at about 180 times better.

The "Magic Valley" at the Lower Kern River in California has had to fight on after the two major accidents in the last two years. The better, stand early this month with the railroads. We succeeded in getting a second major railroad to long competitive service to our highly productive area. We did the work with the truck line and the bus line and, before the west was won, the two major railroads in the Valley were unable to get around because of an extremely severe bottleneck that is a constant occurrence to a great many Texas competitors.

Within these days the cluster was re-

arranged, but the team had been close through the days of management and the organization of the attorney for our competitor. The cost of making this change, added to the losses incurred in our operations, was sufficient to convince us that we should close down the operations of *Vid-Air Lines*, Inc., after two years of being in business and, possibly, pending a decision by the CAB in our case.

Preparably, during our operation and particularly within the last few months, we have received inquiries from organizations from various parts of the country that represent individuals who are interested in getting into the business of providing service for their community. In doing this, they acknowledged our pioneer leadership in this field. We hope to be the role of the aviation industry that any organization as we have will not dare turn from us. We are truly expanding our operations to the best of our ability. The need remains, however, for the field to be served at the hands of the most qualified col-

leagues. During the same two years as which this service was maintained, we did not image as much as a finger of my passenger or crew members. We carried over 5000 passengers representing over 1.5 million passenger miles. The use of our aircraft in the manner we operated at 95 percent-plus schedule completion.

Although we operated entirely within the state of Texas, we were never the last handicapped by not being able to add to our business. As a correlated factor, that might be discussed outside the aircraft.

We figure that some 75 percent of our total traffic was of medium aircraft and that, as a correlated factor, we would be able to assume that percentage to come between 18 and 30 percent. Such a measure to business would permit us to operate at a high enough load factor to obtain a good safety margin.

This was our position when we appealed before the Civil Aviation Board against

for our hearing. We thought we had a simple, local case, based on an excellent record.

We found, however, that the elements of our case (i.e., use of single engine aircraft, infrequent frequency of service in the class in imports, the whole operation general to meet the needs of our customers) were completely destroyed by *Trans World* and *Eastern*. Instead, we spent days going round and round on a never-decreasing list of reports of stock owned. Despite the fact that all of *Vid-Air Lines*' stock is owned by the small group of Valley business men who are extremely interested in many bank notes.

We spent days defending a various attack upon the character of one of our stockholders and former operation manager, and, finally, we spent many days and were eventually forced to show them clear and convincing evidence that our competitor was not a better operator, either, because of an extremely severe bottleneck that is a constant occurrence to a great many Texas competitors.

Within these days the cluster was rearranged, but the team had been close through the days of management and the organization of the attorney for our competitor. The cost of making this change, added to the losses incurred in our operations, was sufficient to convince us that we should close down the operations of *Vid-Air Lines*, Inc., after two years of being in business and, possibly, pending a decision by the CAB in our case.

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